



PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference E-2144/04	FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/IT2004/000231	International filing date (day/month/year) 23.04.2004	Priority date (day/month/year) 23.04.2003	
International Patent Classification (IPC) or national classification and IPC F16H55/56, F16H61/00			
Applicant DAYCO EUROPE S.R.L. ET AL			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 7 sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 23.02.2005		Date of completion of this report 01.09.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer Revilla Soler, X Telephone No. +31 70 340-4092 	

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/IT2004/000231

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1, 4-11	as originally filed
2, 2a, 3	filed with telefax on 23.02.2005

Claims, Numbers

1-13	filed with telefax on 23.02.2005
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Drawings, Sheets

1/2, 2/2	as originally filed
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- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/IT2004/000231

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-13
	No: Claims	
Inventive step (IS)	Yes: Claims	1-13
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V:

Technical field: A pulley for a continuously variable transmission

State of the art: The document EP 1 227 267 constitutes the closest prior art. This document discloses a pulley suitable for a CVT with all the features of the preamble of independent claim 1. In particular, the cam means are co-moulded on a support.

Problem: Complex assembly.

Solution: This solution is fulfilled by the additional features described in the characterizing portion of independent claim 1. The cam means consist of a single tubular plastic body co-moulded on the supporting shaft. This single piece simplifies the manufacturing process.

The pulley claimed in the present application is not known nor is it rendered obvious by the available prior art.

Thus, independent claim 1 and the dependent claims 2-13 meet the requirements of Article 33(2) and 33(3) PCT in respect to novelty and inventive step.

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pulley, respectively, and are coupled together to provide an additional component of axial load when the drive is in the acceleration or deceleration phase.

The technique is known of making the cam and the cam
5 follower as distinct bodies to be connected to the fixed half-pulley and, respectively, to the mobile half-pulley, for example by operations of welding or bonding.

The driven pulleys of a known type described above are in general far from satisfactory in that they are
10 made up of a relatively large number of components and require times and hence costs for assembly that are relatively high. The drawback outlined above is basically due to the fact that the cam, the cam follower and the two half-pulleys are built using moulding processes that
15 are separate from one another and they must be assembled together by means of a relatively large number of operations of relative positioning and connection.

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DISCLOSURE OF INVENTION

The purpose of the present invention is to provide a
20 pulley for a CVT which will enable the problems outlined above to be overcome in a simple and inexpensive way and preferably will present a high degree of efficiency in the aforesaid device for compensating axial thrust.

According to the present invention, there is
25 provided a pulley for a CVT, the said pulley comprising:

- a supporting shaft;

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EP-A-1 227 267 discloses a driven pulley having a fixed half-pulley and a mobile half-pulley as described above, wherein the fixed half-pulley is connectable to the support shaft by means of a centrifugal clutch. The
5 driven pulley includes a device for compensating axial thrust consisting of individual cams overmoulded on a support disc that is part of the clutch and is rigidly connected to the fixed pulley, and of cam followers integral to the mobile half-pulley. To support the
10 overmoulded cams, sheet metal inserts are provided onto the support disc.

This structure is not free from the above-referenced problems because the driven pulley is relatively complex, has a high number of pieces and entails high
15 manufacturing costs.

- a fixed half-pulley, which is coaxial ~~and fixed~~ to said supporting shaft;

- a mobile half-pulley, which is coaxial to said supporting shaft and is able to slide towards said fixed
5 half-pulley so as to define with the latter a race of variable amplitude designed to be engaged by a belt of said drive; and

- a device for compensating axial thrust, comprising first cam means and second cam means, which are carried
10 by said fixed half-pulley and said mobile half-pulley, respectively, and are coupled in contact with one another in order to generate an axial thrust on said mobile half-pulley in the direction of compression of said belt in response, in use, to a torque acting on said pulley;
15 ~~<in that said fixed half-pulley is fixed to said supporting shaft, and>~~
said pulley being characterized ~~in that said first~~
cam means are defined by ~~at least one body made of plastic material co-moulded on said supporting shaft. In particular, said first cam means are defined by a single~~
20 ~~tubular body made of plastic material co-moulded on said~~
supporting shaft. Preferably, said second cam means are defined by at least one cam-follower portion made of a single piece with said mobile half-pulley.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described with
25 reference to the annexed drawings, which illustrate a non-limiting example of embodiment thereof, and in which:

C L A I M S

1. A pulley (1) for a continuously variable transmission (2), the pulley (1) comprising:

- a supporting shaft (5);
- 5 - a fixed half-pulley (10), which is coaxial and fixed to said supporting shaft (5);
- a mobile half-pulley (11), which is coaxial to said supporting shaft (5) and is able to slide with respect to said fixed half-pulley (10) so as to define
10 with the latter a race (12) of variable amplitude and to be engaged by a belt (3) of said drive (2); and
- a device (28) for compensating the axial thrust, comprising first cam means (22) and second cam means (30), which are carried by said fixed half-pulley (10)
15 and said mobile half-pulley (11), respectively, and are coupled in contact with one another to impart an additional axial thrust on said mobile half-pulley (11) in the direction of compression of said belt (3) in response, in use, to a torque acting on said pulley (1);
- 20 said pulley (1) being characterized in that said ~~first cam means (22) are defined by at least one body (17) made of plastic material co-moulded on said supporting shaft (5).~~ *fixed half-pulley (10) is fixed to said supporting shaft (5), and*
- ~~2. The pulley according to Claim 1, characterized in~~
25 that said first cam means (22) are defined by a single tubular body (17) made of plastic material co-moulded on

said supporting shaft (5).

2. The pulley according to Claim 1 ~~or Claim 2~~, characterized in that said second cam means (30) are defined by a cam-follower portion (30) made of a single piece with said mobile half-pulley (11).

3. The pulley according to Claim 2, characterized in that said mobile half-pulley (11) and said cam-follower portion (30) are made of aluminium.

4. The pulley according to Claim 2 or Claim 3, characterized in that said mobile half-pulley (11) is slidably fitted on a supporting bushing (21) made of plastic material.

5. The pulley according to Claim 4, characterized in that said supporting bushing (21) forms part of said body (17) made of plastic material.

6. The pulley according to Claim 4 or Claim 5, characterized in that said supporting bushing (21) is made of a self-lubricating material.

7. The pulley according to any one of Claims 4 to 6, characterized in that said mobile half-pulley (11) is coupled to said fixed half-pulley (10) with radial play.

8. The pulley according to any one of the preceding claims, characterized in that it further comprises an elastic element (16) axially pre-loaded for pushing said mobile half-pulley (11) towards said fixed half-pulley (10), there being provided positioning means (41, 42, 43)

for pre-loading torsionally said elastic element (16).

⁹/~~10~~. The pulley according to Claim ⁸/~~9~~, characterized in that said positioning means (41, 42, 43) comprise adjustment means (43) for varying the torsional pre-loading of said elastic element (16).

¹⁰/~~11~~. The pulley according to Claim ⁹/~~10~~, characterized in that said adjustment means (43) are carried by an element (38) of axial pre-loading of said elastic element (16).

¹¹/~~12~~. The pulley according to Claim 10 ~~or Claim 11~~, characterized in that elastic element (16) is defined by a helical spring; said adjustment means (43) comprising a ring of holes (43), which are set at an angular distance apart from one another and are selectively engageable by one end (40) of said helical spring.

¹²/~~13~~. The pulley according to any one of the preceding claims, characterized in that it comprises at least one retention seat (7) made in one between said supporting shaft (5) and said body (17) made of plastic material, and at least one appendage (20), which is carried by the other one between said supporting shaft (5) and said body (17) made of plastic material and engages said retention seat (7).

¹³/~~14~~. The pulley according to any one of the preceding claims, characterized in that it comprises a spacer ring (15) carried by one of said half-pulleys (11) and fitted

to a front surface thereof in a position radially internal with respect to said race (12) and facing the other of said half-pulleys (10).